APPENDIX IX

COMBUSTION AND BOILER SETTINGS

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WHEN coal or other commercial solid combustibles are burned directly in the firebox it is difficult and in some cases impossible to obtain a temperature around 1600° C.; though the theoretical combustion temperature of a good grade of coal in an athermal enclosure is about 2050° C. This temperature limitation for a long time hampered the development of many lines of metallurgical and industrial work as the cost of obtaining the required temperatures was too great for commercial use. The limitation arises from the fact that it is practically impossible to force sufficient air for complete combustion through the incandescent bed of fuel; in other words, the bed of burning fuel acts as a producer of combustible gases which in turn must be burned by an additional air supply. The rate at which the air is forced through the fuel bed directly affects the rate at which the fuel is burned, but the mass of air per unit mass of combustible is practically constant under all conditions.

A very interesting series of tests on "Combustion in the Fuel Bed of Hand-fired Furnaces" (Bureau of Mines, Tech. Paper 137) has been made by Kreisinger, Ovitz and Augustine. One of the features of this paper that attracted the writer's attention was the statement that the mass of air per unit of combustible, computed from the analysis of the gases in the upper layers of the fuel bed was, in all cases, less than the mass of air per unit of combustible, as measured by an orifice meter, introduced into the ash pit. The quantity of air forced into the ash pit was also less than the theoretical air supply required for the fuel.

In endeavoring to obtain an explanation of this difference it